ABSTRACT

RESEARCH PAPER: Electrochemical Analyses and Reactions of Malononitrile Derivatives and Phenyl Azide

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The versatile and relatively inexpensive (low energy cost) synthesis of new organic molecules is important for pharmaceutical production, polymerization, and other industrially applicable facets of chemistry. Electrochemical reduction of unsaturated organic compounds at room temperature to new organic products offers a benign and ambient method for the production of such molecules. The compounds, (p-methoxybenzal)malononitrile, **1** , E_{pc} = -1.64 V vs. Ferrocene/Ferrocenium ($Cp_2Fe^{0/+}$), its derivatives and phenyl azide, **2** , E_{pc} = -2.43 V vs. $Cp_2Fe^{0/+}$, were investigated for their redox activities with and without alkylation agents, R-X, via scanning and pulse voltammetric techniques in acetonitrile, acetonitrile/water and tetrahydrofuran as solvents, using 0.1 M $[NBu_4][PF_6]$ as the supporting electrolyte. The redox potentials were measured at glassy carbon and platinum disk electrodes. Controlled potential electrolysis (CPE) of **1** at E_{appl} = -1.75 V vs. $Cp_2Fe^{0/+}$ was yielding *p*-methoxybenzaldehyde (> 90%). CPE of **2** at E_{appl} = -2.54 V vs. $Cp_2Fe^{0/+}$ in air gave aniline in good yield. Bulk cathodic electrolyses of **1** and **2** were exhausted in < 0.5 - 1 h, following the passage of 1 F/mol of analyte. Upon completing bulk reductions at each applied potential, products were characterized by ^{1}H-NMR and GC-MS data analyses.